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APPLICATION

FOR

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TITLE: CONSERVING DISTRIBUTION BANDWIDTH

INVENTORS: PAUL MCALINDEN

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CONSERVING DISTRIBUTION BANDWIDTH

Background

This invention relates generally to systems for distributing information to a plurality of users.

Information may be broadcast to a plurality of users in a variety of environments. Information may be wirelessly transmitted from a network server to a plurality of wirelessly coupled processor-based systems. In addition, hard wired systems may be utilized to distribute information such as television programming to a variety of different users. In one scenario, a catalog of programs is available for distribution upon program selection to a plurality of receivers. Each receiver may determine which program to view.

For example, in a cable television distribution system, each home may have its own receiver. Each user can decide what video information to receive in a so-called video on demand system. When the user selects a particular video, that video is streamed to the user over the available transmission medium.

Obviously, if the transmission medium has a limited bandwidth and there are a large number of users, the possibility exists that each user may pick a different program, taxing the bandwidth of the transmission medium.

In addition, different users may expect to receive video on demand, i.e., upon selection. Thus, different users may select the same video but may do so at different times. Because of the time difference between the selections, the same video may be transmitted to two different receivers but two different channels may be required because of the difference in start time of each video.

As a result, transmissions, such as video transmissions, to a large number of users may result in the consumption of relatively large amounts of bandwidth. The resulting bandwidth requirements may tax available resources. As a result, video on demand systems for example, are not widely available at this time.

Thus, there is a need for better ways to conserve bandwidth in the distribution or transmission systems for distributing information to a plurality of users.

Brief Description of the Drawings

Figure 1 is a schematic depiction of a system in accordance with one embodiment of the present invention;

Figures 2A through 2C are timing diagrams for three different channels in accordance with one embodiment of the present invention; and

Figure 3 is a flow chart for software in accordance with one embodiment of the present invention.

Detailed Description

A distribution system 10, shown in Figure 1, can distribute information from database 14 to a plurality of receivers 24, only three of which are shown in Figure 1. The distribution medium 22 may be an airwave medium such as a conventional broadcast transmitter, a satellite distribution medium, or a hard wired medium using cable or optical fibers as two examples.

The system 10 may take a variety of different forms and may be involved in many different applications. For example, in one embodiment, the system 10 may be a cable distribution system that distributes video on demand. As another example, the system 10 may be a telephone system that provides information to a plurality of receivers 24 in the form of telephone receivers. The telephone receivers may be wireless or cellular telephones. As still another example, the system 10 may be a network that distributes information to a plurality of receivers 24 in the form of processor-based systems. In one example, the system 10 may be a local area network (LAN) including wired or wireless LANs. As another example, it may be a metropolitan area network (MAN).

The system 10 may include a server 12 coupled to the program database 14 and a storage 16 coupled to the server 12. A transmission system 20 may be coupled to the server 12 to place data from the program database 14 in an

appropriate format for transmission over the available transmission medium 22. Software 18 may control the transmission of data by the server 12 and that software 18 may be stored on the storage 16.

In one embodiment, programs stored on the program database 14 are distributed to receivers 24. While the word "program" is utilized in connection with the database 14, it should be understood that the present invention is in no way limited to television programs. It may apply to music, video, television programs, commercials, software and games, to mention a few examples. Thus, the term program is simply used to refer to any electronic file that is distributed by the server 12 to the receivers 24.

Turning to Figures 2A through 2C, in some cases, the same program may be distributed to more than one receiver 24 such as receivers 24a and 24b. In some cases, the programs are distributed on an on-demand basis. Thus, the distribution of the program begins upon receipt of a request from a receiver 24. As a result, two programs may be distributed to two different receivers. Two different channels may be needed to distribute the information because the programs are streamed to the receivers 24 and one receiver 24 may have begun receiving the transmission before another receiver 24. As a result, the amount of bandwidth required to transmit the same program starting at different times to two different receivers corresponds to

the bandwidth that would be needed to distribute different programs to two different receivers.

As shown in Figure 2A, a channel X may be utilized to distribute a program A to receiver 24a, channel Y may be utilized to distribute a program B to receiver 24b, and channel Z may be utilized to distribute a program A to receiver 24c. However, the distribution to receiver 24a may begin 30 seconds, as one example, before the distribution of the same program to the receiver 24c. As a result, three different channels may be utilized to accomplish the distribution of two programs to three receivers 24.

Referring to Figure 2B, the software 18 stored on the server 12 may enable the server 12 to attempt to decrease the time difference between the distribution of program A to receivers 24a and 24c. At periodic intervals, spacing may be provided in the distribution of the program to the receiver 24a and the distribution of the program to the receiver 24c may be similarly compressed in some embodiments.

Techniques for expanding or compressing streaming files are well known. In one embodiment, a filler may be provided. In another embodiment, different degrees of compression or lack thereof may be utilized.

Progressively, over time, as shown in Figures 2B and 2C, the gap between the program on channel X and the same

program on channel Z is decreased until there is no gap whatsoever as shown in Figure 2C. As a result, the program A may be sent to both receivers 24a and 24c using channel X. This frees channel Z for the distribution of other content.

Turning to Figure 3, the software 18 begins by detecting common programs on different channels as indicated in block 30. When such a situation is detected, the time difference between the programs (delta T) is determined as indicated in block 32.

A check at diamond 34 determines whether the time difference is less than a predetermined amount of time. The predetermined amount of time may be an amount of time such that is not worth attempting to remove the time difference. In some cases, the amount of compression or packing that may be needed to save bandwidth may unduly distort the programming. In such case, the separate channel distribution is maintained.

However, if the time difference is within an acceptable range, the time difference may be progressively removed, as indicated in block 36. Again, conventional techniques may be utilized to decrease the rate of data flow to one receiver 24 and/or to increase the rate of data flow to the other receiver 24.

Eventually, a check at diamond 38 determines whether the gap has been substantially removed and therefore, one

of the two channels should be made available for other information as indicated in diamond 38. At the same time, one of the two channels may be assigned to distribute the same information on the same channel to both receivers. If a channel is now available, that channel may be assigned to another program as indicated in block 40. If not, the time warping continues in block 36.

While the present invention has been described with respect to a limited number of embodiments, those skilled in the art will appreciate numerous modifications and variations therefrom. It is intended that the appended claims cover all such modifications and variations as fall within the true spirit and scope of this present invention.

What is claimed is: